Psychology

ROBERT S. DANIEL

THE FIELD OF PSYCHOLOGY is reputedly well supplied with bibliographic tools inasmuch as its three major literature guides span the entire history of psychology as a science. Rand's *Bibliography* [1] is the best source of nineteenth century literature, the *Psychological Index* [2] covers the period 1894–1935, and the *Psychological Abstracts* [3] has been published continuously since 1927. Other important aids to bibliographic search include the *Psychological Bulletin* [4] and the *Annual Review of Psychology* [5] for integrative, critical surveys of major topic areas. For book reviews, the journal *Contemporary Psychology* [6] is essential and the *Harvard List of Books in Psychology*,[7] revised most recently in 1964, is an annotated and classified list of 704 selected books. The various editions of the *Mental Measurements Yearbook* [8] are standard sources of information about psychological tests of all kinds. Although there has been no definitive bibliography of bibliographies since Louttit's [9] in 1927, the annual index to *Psychological Abstracts* includes extensive listings under the primary entry "bibliographies" which adequately meets that need. Daniel and Louttit [10] reviewed bibliographic problems in psychology, including search guides, primary and secondary sources, reference materials, and search techniques, in 1953.

If the total listings in the continuous coverage provided by Rand, the *Index*, and the *Abstracts* can be accepted as a reasonable representation of the volume of psychological literature, it is not impressively large. In a period of approximately one hundred years, the total number of titles produced by this criterion is just under 400,000. Compared to literature volume in medicine, the various biological sciences, or chemistry, for example, this relatively small figure suggests that a psychologist should have little difficulty in retrieving needed information.

There is ample available evidence to the contrary. Along with the

Robert S. Daniel is Professor of Psychology, University of Missouri.

other sciences, the growth rate of new journals is rising sharply. More than half (54 percent) of the psychological journals currently reviewed for the *Psychological Abstracts,* were not yet established fifteen years ago. Entries in the *Abstracts* for 1965 doubled the number included two years previously. In part, the increment came as a response to the expressed needs of the profession for more rapid access to current literature. With the support of a National Science Foundation grant, the publication lag for the *Abstracts* has been reduced from eighteen months or more to two or three months.

Even though delay in the appearance of abstracts has been reduced to a reasonable minimum, the results may not fully satisfy active researchers. Several studies reported from the American Psychological Association's (APA) current Project on Scientific Information Exchange [11] show dramatically how dependent psychologists are upon informal methods of seeking scientific information from colleagues. For some of them, books, journals, abstract guides and libraries are scarcely used at all. Of much greater importance is the mimeograph or the photo-duplicator (for preprints), airmail and telephone (for point-to-point rapid information), and the travel authorization (for conventions, symposia, and the seminar circuits).

Garvey and Griffith [12] have analyzed the nature of informally communicated scientific information. Most obviously it is current, and it is this feature which puts it in such heavy demand. It is frequently reported several times, progressively to larger audiences and in a more formal manner, but not necessarily of progressively greater usefulness to the recipient. Channels of informal exchange are based upon known research interests of the scientists in the group, hence the information always has higher relevancy than does formal material because the retrieval and identification steps are less demanding. Probably the most valuable feature inherent in the informal format is the semi-privacy. Psychologists are more willing to speculate, to generalize, to be self-critical, to reveal their way of thinking, to interact creatively with others, and in general to be freer in their communication. Feedback from such communication surely assists the communicator to shape his own work, as well as to reward and encourage him in its continuation.

The demand for knowledge concerning current research of colleagues may reduce conventional library facilities to an archival function unless new services are developed. Researchers have always given heavy emphasis to recent progress, leaving the classic work to the

historians and textbook writers. In psychology, as in other sciences, virtually everything an author uses for research bibliography has been published recently, is about to be published, or is just reaching the writing stage. Perhaps the clearest quantifiable evidence is to be found in citation behavior of psychologists. Tabulation of publication dates of cited titles for a defined discipline, subject, or journal may be converted to citation age and plotted in a distribution to show patterns of literature usage.

Figure 1 contains curves typical of several studies available. The solid line represents all of the citations in the 1950 volumes of the twenty journals considered to be a definitive list of U.S. basic psychological journals at that time.[13] The data show that more than 35 percent of citation usage was of very recent publication (less than five years old), 75 percent less than fifteen years old, and 90 percent less than twenty-five years old.

Although Lawler's data [14] for the 1958 literature are gathered from a smaller sample of six journals, his distribution is plotted for comparison. The two curves suggest a shrinkage in the citation age statistic, since Lawler's data show greater usage of five to ten year old titles and less usage of ten to twenty year old titles than does the 1950 distribution. In order to check on this possibility, the Lawler study was replicated with new data from the 1965 volumes of the same journals. The resulting distribution, shown in the dotted curve, supports the shrinkage hypothesis and suggests that it may be continuing, although at a reduced rate. The median age of all citations was 9.00 years in 1950; 6.11 years for the 1958 sample of journals; and 5.75 years for the same sample in 1965. The modal age was three years in 1958 and also in 1965. Perhaps the asymptote for this function will be a minimal median of 5.50 years, at least under current formal information distribution systems.

Of somewhat greater interest is the frequency of citations in the 1965 data to contemporary, unpublished work. Considering the publication lag for articles from which the citations were taken, a close estimate can be made of the titles authors used in their reference lists but which they could not have seen in print at the time their own manuscripts were submitted. This figure for the six journals in the sample is (conservatively) 8 percent of total citations. Thus testimony about informal information-seeking practices, gathered by questionnaire in the APA studies,[15] is reflected in actual citation usage.

Several implications can be drawn from these observations—impli-

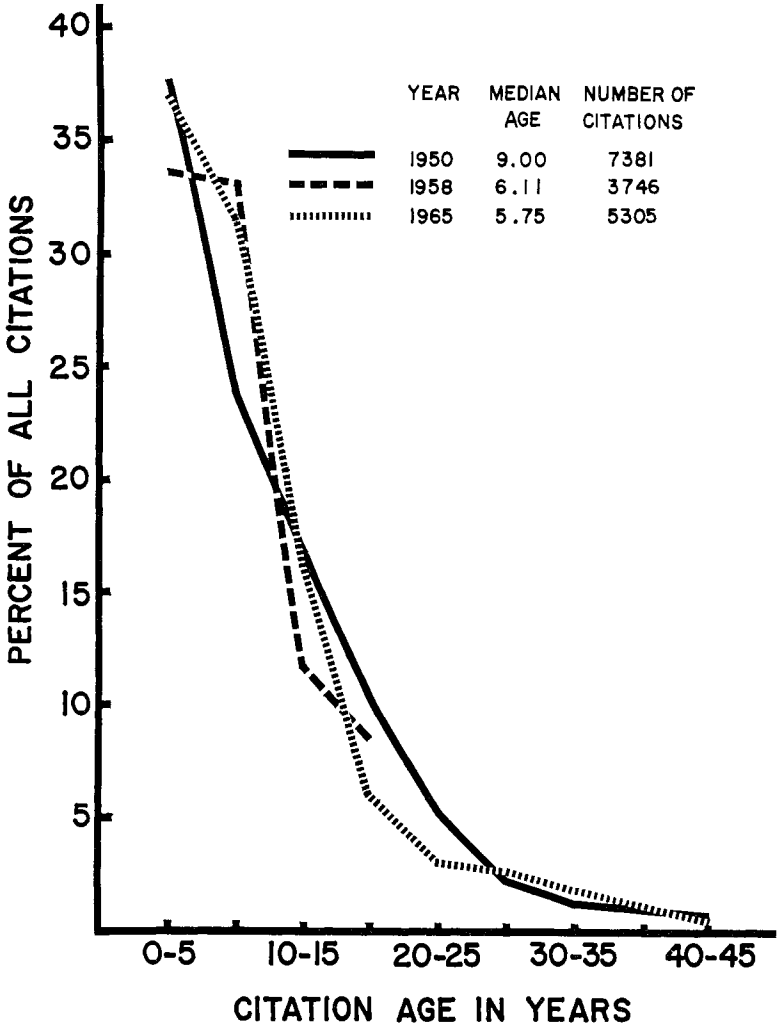

Figure 1. Age of journal articles cited in annual volumes of psychological journals. (Source: 1950, Daniel; [13] *1958, Lawler;* [14] *1965, original.)*

cations which are not altogether comforting. There is little doubt that first-hand knowledge about colleague's current research is an advantage to an author. It probably facilitates the acceptance of research reports and it surely is beneficial in the present competitive world of salary raises, promotions, and research grantmanship. It

probably contributes to the quality of research and to the zeal with which it is accomplished. But it is not an efficient system. Travel, correspondence, and telephoning are costly pursuits in time and funds. Other questions arise. Is there a danger of an informal communication network developing into a clique, excluding those who might otherwise be significant contributors? Is the isolated researcher, dependent upon library facilities alone, unfairly handicapped? Are methods available (or capable of being developed) which would result in greater availability of current information?

Psychologists consider the problem of rapid information retrieval to be important. In a 1959 report from the Board of Scientific Affairs of the APA it was stated that "of all the problems [the Board has] considered, the efficient and effective communication of scientific information presents one of the most critical problems to psychology today." [16] Shortly thereafter the Scientific Information Exchange Project was initiated with the support of a National Science Foundation grant. The initial objective of the study was descriptive: to develop "a natural history of scientific information exchange" for psychology. Two other objectives were added as the work progressed: manipulation of psychology's system of communication and the development and application of information exchange theory to the scientific problem in general. At the present time, fifteen technical reports [11] have appeared from the project as well as summary articles in psychological [17, 18] and other [19] journals.

Some of the planned manipulations have been put into effect. During 1965 four selected journals in psychology listed titles of all articles accepted for future publication. Authors and addresses were provided in order that preprint copies might be requested. Evaluation of this project is continuing, but preliminary examination [20] has shown that 91 percent of listings resulted in inquiries, and 87 percent of those making requests had first known of the study through the prepublication listing. These data are clear evidence of the market for early information, and they support the observation that the informal market deserves to be expanded.

The substantial reduction of publication lag in the *Abstracts* in 1965 was partly a consequence of project findings. Further reductions in lag, as well as a number of additional benefits, are expected to result from the shift to computer-controlled printing in 1966. All of the contents of the journal will be tape recorded to "provide data for the evaluation and control of . . . operations and . . . new information

services to . . . users of psychological information." [21] Indeed, contemporary issues of the *Abstracts* come very close to providing the "current awareness" hoped for by both editors and users.

As these improvements develop, psychologists are vitally interested in the innovations and solutions in other sciences for two reasons. Psychological study of the communication process, at both a theoretical and applied level, is a problem of long standing quite apart from the immediate practical necessities of the scientific information crises. Psychological research should be integrated with that from other disciplines concerned with communication toward the development of theory and practical applications. In the preface to Volume 1 of the APA project reports Brayfield wrote, "the subject matter of scientific information exchange lies in the realm of psychology." [22] Bodin has suggested that "Searching and indexing may develop into a field for a new type of specialist who combines training in psychology and library science: psychology information retrieval technician." [23]

An equally important reason for close liason with other disciplines—indeed an essential requirement for the psychologist—is his need for access to the literature of many other subject fields. Should highly divergent bibliographic techniques emerge within the next decade, the psychologist's retrieval task would be annoying at best and chaotic at worst. Psychologists generally believe that their bibliographic needs spread outward into more other fields than is the case for any other representative discipline. This is the problem of bibliographic scattering.

Casual evidence for the far-ranging nature of scattering for psychology is readily available. Psychological materials are to be found in each of the basic Dewey Decimal categories, whether one selects by title or by content, and the scattering is only a little less in the Library of Congress system. In 1965 the *Abstracts* staff examined 637 periodicals in order to reach needed coverage, not more than 28 percent of which could reasonably be considered psychological journals. Yet one of the constant complaints of *Abstracts* users is that it fails to provide sufficient coverage of peripheral material. Garvey and Griffith report that "The APA project has encountered nearly 1000 journals which are used in some way by psychologists. Of these there are only a few which are highly relevant to psychology." [24] A former editor of the *Abstracts,* C. M. Louttit, has discussed the problem of coverage,[25] noting that the percentage of searched journals which are clearly psychological has remained steady at around 30 to 35 percent since

initiation of the journal. He also reports that other fields covered include psychiatry, medicine, education, and biological science, in descending proportions.

Convincing evidence of the need to use literature guides in other fields was provided by a graduate class project used at various times by the author. The student was asked to suppose that he was planning to publish in a designated journal. Then he took an annual volume of that journal and determined the number of references found there which the authors could have located in the *Abstracts*. A sampling technique was used to keep the clerical work within bounds, but the results were clear nevertheless. At the very best, the *Abstracts* can be expected to supply 85 percent of citation needs, and the figure is appreciably less for many of our journals or topics. Adams [26] presents data to show that the *Abstracts* cover only about 30 percent of the major research of German and Austrian psychologists. Louttit [27] calculates total coverage ranges from 29 percent for an interdisciplinary topic to 100 percent for the topic of learning. Although current efforts to widen the scope of the *Abstracts* will undoubtedly increase needed coverage, they cannot be expected to eliminate the problem altogether. Problems of obtaining abstractors, elusive or fugitive materials, and the sheer bulk of potentially useful titles in peripheral areas prevent any abstract journal from ever providing full coverage, as pointed out by Bradford.[28]

Comparison of scattering in psychology with that in physics and chemistry has been shown previously by the author [29] by use of his own data and that provided by Fussler.[30] In these studies it was shown that all three fields used endogenous citations to very nearly the same extent (70.4 percent, 72.7 percent, and 72.8 percent respectively). But the remaining citation needs spread over four fields for physics, five for chemistry, and eight for psychology.

More recent data are available from one of the APA project studies.[31] Scattering is shown in terms of the eventual journal publication of 375 papers read at the 1957 national convention of the Association. By retabulating the data in terms of the disciplines with which the 92 journals are identified, it is evident that 63 percent of the original reports appeared in psychological journals, 15 percent in interdisciplinary (psychology-related) journals, and the remaining 22 percent in nine different disciplines clearly not psychology.

In developing his Law of Scattering, Bradford selected a definable area of science, then tabulated its bibliographical titles by the journal

cited. After rearranging counts in the order of frequency, from most to least, the data were cumulated and plotted in terms of citation needs as a function of the logarithm of the number of journals. This procedure gives a yield curve, showing the number of journals needed to satisfy various proportions of the completed bibliography. In his own words, the relationship is "that the aggregate of papers in a given subject, apart from those produced by the first group of large producers, is proportional to the logarithm of the number of producers concerned, when these are arranged in order of productivity." [32]

This technique, with some modification, can be used to advantage to examine the claim of psychologists that their literature needs involve them in searching widely scattered sources. It was used by the author in an unpublished study of the annual volume of twenty psychological journals in 1950.[13] The 7,381 journal article citations found therein referred to 660 different journals. One fourth of the citations used came from less than 1 percent of the journals; 50 percent of citations required only slightly more than 2 percent of the journals. But at the other end of the cumulative curve, the last 4 percent of needs required 310 different journals (47 percent). It is evident that, at the outer limits of needs, scattering is impressive. The results of this study did not agree with the linear relationships found by Bradford, but it must be remembered that he was dealing with research titles *in* a subject area, whereas the 1950 study was concerned with those titles cited by authors in the broad field of psychology. Authors undoubtedly use even more articles and journals than they actually cite.

Is the scattering shown by the study quoted above greater than that which might be found in other disciplines? In an effort to answer this question original data were obtained from journals considered to represent the research output of certain fields. Physics was selected from the older sciences as probably the least scattered of the major scientific areas. Two journals from biological sciences, zoology and physiology; two from social sciences, sociology and anthropology; and an education journal were also analyzed. Thus a comparison is provided between psychology and those areas with which it is commonly related. Three psychological journals were included, one showing clearly the least scattering in the 1950 study and two which showed maximum scattering.

Data from the analysis are shown in Table 1. The *American Journal of Sociology* was analyzed for a two-year period in order to obtain a

TABLE 1

*Literature Scattering as Indicated by References in Selected Journals**

Journal	*Year*	*Total Citations*	*Journals Cited*	*Citations per Journal*	*Percent Citations to self*	*No. of Journals to* 50% *of needs*	75 *n*
of Experimental Zoology	1965†	639	196	3.25	12.99	17	
n Anthropologist	1965	557	171	3.26	25.30	13	
of Educational Research	1965	448	120	3.73	7.81	14	
n Journal of Sociology	1964–65	495	127	3.89	19.79	5	
of Applied Psychology	1965	423	83	5.09	26.00	5	
of Clinical Psychology	1965	669	106	6.31	19.57	6	
n Journal of Physiology	1965†	1705	236	7.22	18.82	10	
of Experimental Psychology	1965	1556	104	14.96	39.39	3	
Review	1965†	1505	77	19.54	43.20	2	
of Clinical Psychology	1950	274	82	3.34	13.87	9	
of Applied Psychology	1950	333	80	4.16	28.83	6	
of Experimental Psychology	1950	752	74	10.16	33.51	3	
Review	1946, 1950	3788	105	36.08	56.00	1	

ırces: 1965 data are original; 1950 data are from Daniel, (see reference 13); 1946, 1950 data are from Schauber (see 33).

nple of approximately one-fourth year. All others for year(s) indicated.

satisfactory sample. For physics, zoology, and physiology a sample of approximately one-fourth year was considered sufficient. The annual volume was used for all others.

The fields studied are ordered in the table according to the degree of scattering as revealed by the criterion of mean citations per journal (column five). Zoology and anthropology are the most scattered with a mean of about three citations per journal, whereas physics at the other extreme shows six times the mean yield rate of anthropology or zoology. Three other criteria are provided, the percentage of self-citations (independence or inbreeding), the minimum number of journals required to satisfy 50 percent of citation needs, and the number required to satisfy 75 percent of needs. By these additional criteria the ordering of fields is somewhat different than it is in terms of the simple index of citations per journal, notably in the level of self-citations. With the exception of the most- and the least-scattered by this criterion, others are too close together to yield reliable differentiations. Data for the final two criteria agree rather well with the citations-per-journal index, with the exception of physiology and possibly clinical psychology, which appear to be more scattered on the last two than they do on the first index.

Scattering is shown graphically for these nine journals in Figure 2. In order to adjust for different sized samples, the plots are made in terms of the percentage of citation needs provided by various percentages of the total number of journals required, both variables being plotted logarithmically.

The lower the curve the greater is the scattering of needed literature across journals. Elevation of a curve at the left end reflects very heavy usage by a journal of its own past issues and those of closely related journals; elevation at the right results from little dependence upon remote journals. Patterns within the range of journals needed and citations needed may be seen to vary among these nine representative journals.

There is no evidence from this analysis for a unique or special degree of scattering of the literature needed by psychologists. Neither the quantifications of Table 1 nor the patterns shown in Figure 2 indicate that psychological journals are particularly different from representative journals in closely allied fields. The serial literature needed by authors in the *Journal of Experimental Psychology* closely approximates that pattern shown by the *Physical Review,* and reflects a low level of scattering. The other two psychological journals stand about

midway within the group and are clearly less scattered than are the needs in education, zoology and anthropology.

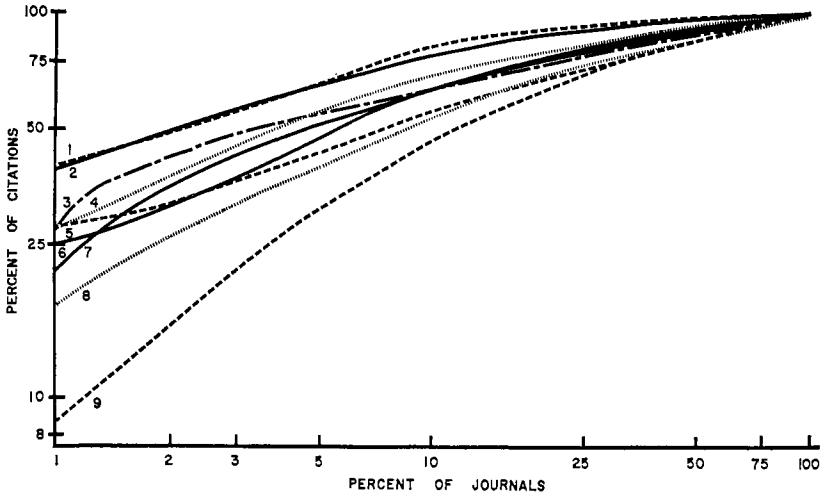

Figure 2. Percentage of journals required to satisfy percentages of citation needs for selected journals.

Key: 1. Physical Review, 1965 (one quarter)
2. Journal of Experimental Psychology, 1965
3. American Journal of Sociology, 1964-65
4. American Journal of Physiology, 1965 (one quarter)
5. American Anthropologist, 1965
6. Journal of Applied Psychology, 1965
7. Journal of Clinical Psychology, 1965
8. Journal of Experimental Zoology, 1965 (one quarter)
9. Journal of Educational Research, 1965

One question the Bradford type of analysis does not answer is the following: What proportion of the citation needs of authors in a given journal is satisfied by journals in the same discipline, and thus should be expected to be retrievable from the literature guide which is standard for that field? Data relevant to this question were available from the protocols and were obtained for some of the journals examined. For physics, 94 percent of the references are to physics journals; experimental psychology, 86 percent to psychology journals. Comparable figures for clinical psychology, 69 percent; for applied psychology, 79 percent; for anthropology, 56 percent; and for education, 41 percent.

Although psychologists' claim to a problem of severe scattering of their literature needs is not supported by these analyses, it is interesting to examine trends since 1950. Data for three psychological journals from the earlier study,[13] are presented in Table 1 along with comparable data for physics adapted from a study by Schauber.[33] Examination of these data will reveal that psychologists' needs become less scattered whereas physics' become more scattered from 1950 to 1965.

Nevertheless, a psychologist of almost any research inclination finds it necessary to make use of guides in allied fields. Some of his needed interdisciplinary journals are well covered by the *Abstracts*, but some are not. Beyond the interfaces with psychology lie those areas where psychologists say they need to seek information. One study [34] shows that these disciplines rank as follows, from most to least needed: physiology, sociology, other biological sciences, mathematics and statistics (including computer science), anthropology, education, electronics, psychiatry, and philosophy.

In another study of the recent APA series,[35] a sample of sixty-three psychologists who were active in research indicated that they published in or subscribed to journals in the following fields in addition to psychological and interdisciplinary journals: education, social sciences, various medical sciences, general science, business, psychiatry, biological sciences, speech and hearing, language and communication, mathematics and statistics, and physical science (in decreasing order of incidence). That rankings in those two studies do not agree may be interpreted as reflecting great variations between groups of psychologists.

Indeed, it is in this respect that diversity in bibliographic needs of psychologists is most demonstrable, and its nature becomes clarified. The three psychological journals used in the analysis discussed above referenced a total of 214 different journals. But for any one pair in the triad, the journals referenced in common amount to only about 34 percent of the total needed by either one of the pair (range: 29–39 percent). Furthermore, of those journals which are referenced in common, the relative usefulness (yield) to each of these three journals examined is different. A statistic which reveals yield pattern similarity is rank difference correlation, which is only +.28 between experimental and clinical fields, +.42 between experimental and applied, and +.51 between clinical and applied. Comparable correlations for two representative physiology journals and two representative sociology journals are +.64 and +.63 respectively.

From the foregoing analyses it appears to be clear that for any individual researcher in psychology, the probability of scattering in his literature needs is no greater than it is for individual workers in other fields. Indeed scattering may be less for certain specialists in psychology (e.g., learning research) than for their colleagues in allied disciplines. On the other hand, some evidence has been presented to show that among a group of psychologists with different research inclinations, their collective literature needs are somewhat more diverse than would be expected for a comparable group of workers in either sociology or physiology.

In summary it may be said that psychologists have ready access through well known guides to the entire literature considered to be within the field during the first century of its life span as a science. In recent years there has been an emerging emphasis upon informal methods of information exchange in order to keep up with the very latest developments in problems with which one is working, and changes in the *Psychological Abstracts* policy are reflecting these needs. It is the demand for access to literature outside of the field which constitutes one of the significant current bibliographic problems in psychology, and apparently in other sciences as well. Although scattering may be somewhat more serious for psychologists, it is sufficiently critical in many fields that concerted and cooperative programs are needed to achieve efficiency in scientific literature retrieval.

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